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March 1, 1930



BEAUTY IN A WAYSIDE DITCH

Oil Bubbles Flatten Into a Mosaic of Mirrors

(See page 141)

Vol. XVII

No. 464

Rules Waves, But Not Food Supply

Military Science—Economics

Briton Says U. S. Controls His Country's Bread

THE United States could disrupt Britain's essential food supplies, and probably stop a great share of her oil, "without manning a cruiser or mobilizing a gunboat."

This opinion is expressed in a long leading article in the English technical journal, *Engineering*, devoted to a consideration of the problem of cruiser and destroyer limitation. As the writer summarizes the principal sources of food supply to the British Isles, he states that well over 60 per cent. of all the wheat imported comes from Canada and the United States, and "is therefore undefendable by naval forces."

He draws an unlovely picture of what might happen in the event of hostilities between the two countries:

"The United States can stop their own exports by an executive order from the Government, and if they sent a few brigades of calvary across the Canadian border with orders to destroy the Canadian Pacific Railway, burn the farmsteads, and blow up the grain elevators, they would very seriously diminish, if not actually stop, Canadian supplies to this country. We should be no nearer securing the supply if we doubled our naval forces and maintained a cruiser fleet five times as powerful as the American."

Of the 3,600,000,000 pounds of sugar imported into the British Isles each year, 1,400,000,000 pounds come from Cuba alone, and 800,000,000 pounds more from Peru and the West Indies. The writer conjectures that:

"By a great naval exertion it might be possible to secure the 200,000,000 pounds raised in the British West Indies, but it is safer to assume that it is within the power of the United States to stop about 65 per cent. of our total sugar supplies by the ordinary procedure of economic control.

Argentine supplies would probably be stopped by the same process. We import annually some 950,000,000 pounds of chilled meat, 800,000,000 of which come from Argentine companies under American financial control. Ten squadrons of British cruisers would not secure such supplies if a joint committee of American bankers, lawyers, and Treasury experts decided that they were to be stopped."

The situation as regards oil is not so well known, the article states. About a quarter of the British supply is said to come from Persia, and would therefore be immune to any probable attack by American forces. But the remaining 75 per cent. a large part is believed to be under American control.

The writer concludes that the British government has therefore acted wisely in conceding the principle of American naval parity, and entrusting the welfare of British interests, so far as the United States is concerned, to the Foreign Office.

Japan as a possible menace to Britain's essential commerce is dismissed lightly, in spite of the formidable strength of the Japanese navy. It is conceded that the Japanese could destroy all British trade north of Shanghai; but it is pointed out that the whole Far Eastern trade, from Singapore onwards, represents only about 5 per cent. of the Empire's total, and need therefore not be considered as a major problem.

It is in the Atlantic trade lines that the "Achilles' heel" of England is to be found, the writer declares. The commerce-raiding possibilities of Continental naval powers or combinations of powers are the things against which the British navy may reasonably be asked to protect the homeland.

Surface cruisers are not regarded as seriously as commerce-destroying submarines by the writer. In spite of the spectacular successes of a few German raiders during the war, the disturbance to the total of British shipping was temporary and relatively slight. But submarines are another matter, and it is against the U-boat menace, in the opinion of the writer, that the British navy should direct its major preparedness. The convoy system used successfully during the war involves large numbers of light cruisers and destroyers, and he expresses some anxiety lest his Government should concede too much in the way of limiting these classes of ships during the present conference.

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The Answer Is In This Issue

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Radio to Bring Safety to Aviation

Radio—Aeronautics

Herbert Hoover Jr. Predicts its Compulsory Use

GOVERNMENTAL requirements for the use of radio on all passenger airplanes, similar to those in effect at present for ocean ships, are seen in "a matter of months" by Herbert Hoover, Jr., radio engineer with the Western Air Express, in a paper that he presented before the meeting of the Society of Automotive Engineers. Radio is essential to the continued success of air transportation, he said.

"Radio for aviation is a comparatively new thing," said Mr. Hoover. "It is true that two-way communication with planes while in flight took place as long ago as before the war, but the intensive application of it to commercial transportation is but a little over a year old. In this short period it has been necessary to develop apparatus of a type quite different from anything used before, to iron out all the difficulties relative to its installation and performance in airplanes, to install a complete system of ground stations, to organize systems for the rapid collection of weather information of an entirely new sort, and to develop a new technique of radio operation and control. In twelve short months aviation has had to go through twenty-five years of marine experience. I do not want to be misunderstood in saying that marine experience has not been of value in aviation, because it was shipping that provided the initial stimulus for radio development in its early stages. However, it has been the more recent research in telephone broadcasting and the amateur activities on short waves that have had the most direct bearing on aviation radio problems.

"The Airways Division of the Department of Commerce took the first step in providing ground stations for aeronautical use. About 40 stations have been installed or are being erected. They are dotted along the airways approximately 200 miles apart and cover the whole country from New York to San Francisco, and from Seattle to Key West. These stations use voice and have a carrier output of two kilowatts, giving them a conservative day range of 125 miles and a night range of approximately twice that.

"A band of wavelengths between 800 and 1200 meters was set aside for aeronautical purposes by the international convention in 1927, and it is within this portion of the frequency spectrum that the government stations are located.

"A new branch of the Weather Bureau has been built up to make hourly collection and forecasts of the weather, and the reports are then broadcast over the stations of the Airways Division. This service will soon be speeded up until the reports are gathered and broadcast every half hour.

"This service is of immense value to the aviation industry. It means that any flier, whether flying for sport or on regularly scheduled transport business, can now install a simple receiving set and, after eliminating ignition interference, receive the latest weather information almost anywhere in the country. The pilot need not know code, for everything is sent out by voice, and the actual manipulation of the receiver is as simple as any broadcast set in his home."

Wave lengths of 80 to 200 meters are the best of the shorter waves if a single channel is to be used, Mr. Hoover said, but they have the disadvantage that their intensity is greatly reduced at distances over 60 miles. At night they can be used for transmission up to 1200 miles. Shorter waves, from 45 to 60 meters, are much better in daylight for 150 miles or more, but at night, the "skip" effect prevents their use over shorter distances. This would require different wave lengths in day and night flying, but this also has its disadvantages, he said. It either requires the plane to stop and install a different set, or to have a switching device to change while in flight. "Both methods have their complications," he said.

"Shielding is the determining factor in whether or not radio is going to give us safer flying," declared Mr. Hoover.

"Each spark plug in the engine is a miniature radio transmitting station," he explained. "The ignition wires, magneto, low tension wires, and their associated parts form an antenna system. Every time a spark

occurs across any of the plugs a radio impulse is sent into this antenna, and a corresponding signal is radiated out into space. Inasmuch as the wiring of the plane is not tuned to any particular frequency, the spark interference can be received on virtually any wave length from zero to infinity. Furthermore spark transmitters are famous for the interference they create, even when working into sharply tuned antennas.

"If it is imagined, therefore, that a highly sensitive receiver on the plane is trying to pick up a feeble signal from a station which is perhaps one hundred and fifty miles away, and only ten feet away are located from eighteen to seventy-two strong spark transmitters, feeding into an antenna which is radiating on all wavelengths, a fair idea of what ignition interference means can be visualized.

"There is only one solution—all of the spark plugs, the high and low tension wiring, the magnetos, the booster magnetos or coils, the switches, the starters, the generators, the batteries, and all of their associated parts must be continuously enclosed in a grounded metallic shield. The chief difficulty, in practice, arises in making an installation that will stand up under the continuous grind of transport service."

By Instruments Alone

NO modern airplane is thoroughly equipped which cannot be flown by instruments alone, declared Lieut. James H. Doolittle, who has taken off, flown and landed "blind" hundreds of times, before the National Aeronautic Meeting of the Society of Automotive Engineers.

"With the instruments now developed and readily available, it is possible to fly indefinitely without being able to see outside the cockpit," he declared. And Lieutenant Doolittle graphically told just how remarkable instruments function to launch a plane into the air, direct its flight and bring it safely back to earth again.

Experiments in flying by instruments alone were begun about a year ago in connection with the Guggenheim Fund (*Turn to page 142*)

Adrenal Glands Save Our Lives

Physiology

By Jane Stafford

THE mysterious bearded lady of the old circus side-shows; Sappho, the great poetess of ancient Greece, whose strange love-life has been severely criticized; the thousands of men and women living today whose peculiar problem has been the theme of recent novels and a much-discussed play; all these have probably owed their abnormality to overfunction of two small glands that cap the kidneys and are known as the suprarenal or adrenal glands.

About the size of a man's thumb, shaped somewhat like the famous Liberty caps of the French Revolution, only of a yellow color instead of the revolutionary red, these small organs are among the most vital in the entire body. Life does not long continue in a body from which they have been removed.

When these glands become overactive in adult life, some of the characteristics of the opposite sex appear; a woman's voice acquires the deep tones of a man's; hair grows on her face; the smooth curves of neck and face and limbs are replaced by more masculine contours. Such a type is the bearded lady of the circus. The condition is known as virilism. Similar charges occur in the male sex; the voice becomes high and squeaky; there is an abundance of fat and a lack of muscular development; the hair on the face and body is scanty.

The earlier in life that these glands become overactive, the more pronounced are the changes in the outward sex characteristics. When the glands are overactive in infancy or childhood, the children mature at an exceedingly early age, sometimes as young as 6 or 7 years. These are veritable child men and women, not, however, to be confused with dwarfs, whose condition is due to abnormality of another gland.

When the gland becomes overactive during the developmental stage before birth, it causes an even more marked change. The characters in certain modern novels, and the living people from whom they are drawn, are of this type. The disharmonies and strangely faulty composition of the body from which these people suffer were known for centuries before Christ, but the unfortunate sufferers have been under a dire social tabu. Only recently have their complex problems become topics of conversa-



Feats of daring and athletic prowess are made possible by the action of the adrenal glands.

tion, just as only recently medical science has learned that the causes of these strange anomalies are to be found in abnormal functioning of the glands.

Of all the organs of the body, the suprarenal glands are among the very most important. Life itself cannot continue without them. They play a large part in regulating the growth and development and temperature of the body. Much depends on their normal functioning. In time of stress they help us to think and act quickly, and often save our lives. The fighter, the soldier, the football player, all depend for their success on good functioning of their suprarenal glands. In modern life, we all of us meet situations every day when our suprarenal glands stand us in good stead. When a man jumps out of the path of an approaching automobile, or swerves his car sharply and jams on the brakes to avoid an accident, the tiny caps above his kidneys have helped him to act quickly enough to avoid catastrophe.

Just how the glands act to help in this way is part of the new knowledge of the body's functions. But the knowledge that the glands were important organs seems to have existed for many centuries.

Primitive peoples knew, perhaps instinctively, that the glands were important to life. They attributed strange powers to them and were careful to eat them along with the flesh of animals. Some races endowed the glands with specific powers, such as courage or wisdom, and fed the appropriate ones to their fighters before battle. Thus they anticipated in a haphazard fashion modern scientific glandular therapy.

Exact knowledge of the glands began with the work of a great French physiologist, Claud Bernard. It was he who gave the name "internal secretion" to the process by which the glands affect our bodies. To him we owe the initial work, begun in 1848, which has placed this subject as a whole on a scientific footing. The adrenal glands themselves were discovered and described in 1563 by the Italian anatomist, Eustachius.

But it was an Englishman, Thomas Addison of London, who gave us the first knowledge of the function of these adrenal glands. He first described in 1849 the strange disease which bears his name and showed that it was due to disease of the suprarenal glands.

Each adrenal gland has two parts, called the cortex and the medulla. These two parts have a different structure, are made up of different kinds of cells, and apparently have different functions. The medulla secretes a powerful substance known variously as adrenalin, adrenin and epinephrin. A small amount of this substance is always present in the blood, acting as one of the regulators of the body processes. Under stress of certain emotions, notably anger and fear, the glands pour much larger amounts of this substance into the blood. When the medulla is diseased, it secretes less than the usual amount of its hormone.

The cortex is considered by some scientists to be the more important part of the adrenal gland. Animals have been known to live when the medulla of the gland is missing, but no animal has ever survived more than a few hours after removal or loss of the entire gland. From this circumstance, it appears that it is the cortex that is essential to life itself. One investigator removed the cortex, leaving the medulla intact. Invariably the animals died. But, in cats and dogs,



The adrenal gland, shaped like a queer cap and just this size, rests above the kidney.

seven-eighths of the adrenal glands could be removed with safety, providing that the remaining portion of gland consisted of cortex. Post mortem examination of the glands following a rapid death from disease of the adrenal glands has shown that the medulla is hardly affected, but the cortex gives evidence of acute disease.

There is a theory that the cortex secretes a hormone of its own, but this has not yet been proved. So far no hormone has been isolated from the gland. Some experiments have been made with cortical extract. These have given results indicative of glandular activity, but the possibility exists that a trace of medullary substance is mixed with the cortical extract.

Addison's disease is a destructive disease of the adrenal glands. Generally the gland is attacked by tuberculosis, and often the tuberculosis spreads to the rest of the body. This disease is always fatal, although persons suffering from it may live as long as six to ten years. The most characteristic and unusual feature of this disease is the peculiar change in the color of the skin. The exposed surfaces at first, and later the entire surface of the body, become a deep bronze hue. In the very early stages of the illness, this change in coloring appears as only a few brown spots on face, hands or arms. Gradually the entire skin undergoes a change.

Patients suffering from Addison's disease become very weak and lose weight. In the last stages they appear entirely emaciated. The tone of all the muscles is considerably lowered and the patients are not capable of much physical effort. They tire very quickly. The pulse is slow and the heart action becomes feeble. The blood pressure and the metabolism are very low. Loss of appetite generally occurs, and the patients often suffer from digestive upsets with severe abdominal pain. Occasionally anemia is present.

Treatment with epinephrin has not been very successful. Extracts of

whole gland have been more effective. The disease is fortunately not a very common one; in a series of 2417 cases studied at the Mayo Clinic, only 13 were Addison's disease. Sir William Osler, who was professor of medicine at the Johns Hopkins University and later at Oxford, saw only 17 cases in the course of 21 years of extensive practice and teaching.

Addison's disease is a wasting process in which the gland is partially destroyed and functions less actively than normal. In the opposite condition, the gland is overactive with the disturbance of the sex characteristics already described. The overactivity may be due to a tumor on the gland and underlying kidney.

The theory that the adrenal glands give the body extra strength in emergencies is held by Dr. Walter B. Cannon, professor of physiology at Harvard University. In his newly published book Dr. Cannon describes experiments by which he and his associates proved the effect of emotions on the adrenals.

In anger or fear these glands pour their secretion, epinephrin into the blood in larger amounts than usual. This speeds the heart beat and raises the blood pressure. The blood is shifted from the digestive organs to the brain, heart and lungs. At the same time the epinephrin has reached the liver, where the body's extra supply of sugar is stored in the form

of glycogen. When the epinephrin reaches the liver in large amounts, the glycogen is released into the blood stream. Sugar is the body's fuel. When more work is to be done, more fuel is needed. Thus in an emergency, this extra supply of sugar, liberated at the signal from the adrenal glands, supplies the greater energy to the muscles needed for offense or defense, and fatigue is warded off. The entire action takes place instantaneously, so that the body is immediately equipped to meet the emergency, whatever it may be.

According to this theory, the successful prize-fighter owes his victory to the functioning of his adrenal glands. All of us have felt the quickening of the pulse and the extra surge of energy in times of stress, anger or fear, which indicates that our adrenal glands are functioning. This action is not confined to human beings. Cannon made his observations on dogs and cats, and another scientist, Dr. A. C. Redfield, found that in lizards epinephrin also acts as part of the protective mechanism. The pigment cells of certain of these creatures act to vary their color in accordance with the shade of the surroundings. This action of these cells is stimulated by epinephrin, while nervous excitement in these animals has a similar effect.

Like the thyroid gland, the adrenal gland is closely connected with the temperature regulation of the body. Cool, bracing climates stimulate the gland to function normally, to secrete and to make a (Turn to page 142)



Sappho, the famous poetess of ancient Greece, exhibited strange abnormalities which were probably the result of disturbance of her adrenal glands.

Medicine Still Hunting Cause of "Flu"

Bacteriology

Experiments Indicate That it May Not Be a Bacillus

IN spite of considerable effort to find the causal agent of epidemic influenza, the present time finds the problem still unsolved, Dr. Peter K. Olitsky of the Rockefeller Institute for Medical Research said in a De LaMar lecture which he gave at the Johns Hopkins School of Hygiene and Public Health.

There are several factors which contribute to the existing confusion and the outstanding difficulty arises from

the necessity of selecting cases of undoubted acute influenza, Dr. Olitsky stated. There has been in the past frequent failure to recognize influenza as a specific, primary disease, and physicians and other scientists have failed frequently to consider as secondary infections the various bacterial pneumonias that develop in lungs injured by the influenzal agent.

Moreover the primary uncomplicated disease is usually mild and tran-

sitory; so that unless the cause is sought in the early hours it may become masked or even supplanted by associated organisms. Also, the rapid and extensive spread of influenza during pandemics makes it difficult to select for control observation cases of perfectly healthy individuals who have never suffered from the disease. Finally, to add to the confusion, a clear clinical distinction has not always been made between primary, uncomplicated epidemic influenza and many different types of upper respiratory infections, such as common colds, acute rhinitis, acute bronchitis and other indefinite conditions which may stimulate a true influenzal attack.

Dr. Olitsky discussed three different agents which have been thought to cause influenza. Pfeiffer's bacilli have not yet been universally accepted as the causative agent, although there is considerable evidence to show that these organisms have some relationship to the cause of the disease, Dr. Olitsky said. The same holds true for streptococci which have been implicated by several investigators since 1917, and most recently by Dr. I. S. Falk, formerly of the University of Chicago.

Some investigators believe that the cause of influenza is a filterable virus free from bacteria of the ordinary species, or bacteria which can be cultivated artificially. Here again additional experimental evidence is necessary before conclusion may be reached.

Dr. Olitsky and his colleague, Dr. F. L. Gates, have been studying the *Bacterium pneumosintes*. These are filter-passing bacteria found in the nasopharynx of man. There are now reported in the literature at least 30 groups of pneumosintes-like organisms mostly isolated by Drs. Olitsky and Gates and by workers studying in their laboratories. Dr. Olitsky drew attention to the fact that this germ was obtained only from cases of influenza. While there has been confirmation now and again of the occurrence of this filter-passing organism in influenza and not in other conditions, Dr. Olitsky said that he and Dr. Gates still maintain the cautious attitude they have previously expressed and prefer merely to present the experimental facts.

Government Test for Schools

Employment Psychology

A PSYCHOLOGICAL project which will personally affect the careers of thousands of boys and girls in the schools of this country is very soon to be put into effect, Dr. L. J. O'Rourke, Director of Research of the United States Civil Service Commission, reported. Dr. O'Rourke addressed a group of directors of research representing school systems throughout the country.

The federal government has joined hands with public school officials and industrial concerns in an effort to improve selection and placement procedures, and to prevent boys and girls from making false starts in finding satisfactory employment, thus lessening the number of misfits and cutting down an enormous economic loss, Dr. O'Rourke indicated.

A first installment of employment tests, now being perfected, will be released to high schools and colleges of the country in a few months, he stated. These first tests deal with stenography, typing, spelling, grammar, and judgment. The tests will be used to determine the standards of ability which boys and girls who plan to enter office work must expect to reach. Later, tests for other occupations will be released.

"Results of the tests," Dr. O'Rourke explained, "will tell the pupil, as long before graduation as desired, to what extent he is prepared to meet actual employment conditions in industry or Government. A prospective stenographer may learn, for example, that her stenographic speed is superior to that of 75 per cent. of stenographers in actual employment, but that her ability to use English is below that of 80 per cent. of successful stenographers. Information concerning her

standing is an incentive when it is received by the student six months before the completion of her course; it may be depressing when it is received, as at present, at the employment office or on the job.

"The use of the standardized tests will make it possible for school vocational directors to recommend students in terms that will be meaningful to employers. Instead of using the vague terms of recommendation that are most common at present, they can tell an employer definitely that a certain girl has greater proficiency than 80 per cent. of the typists already in his employ."

Almost fifty industrial concerns, employing thousands of office workers, have already offered their cooperation with the project, the first ever started to bring together all the people concerned in this great problem of employment. Committees made up of outstanding educators and industrial leaders will aid in furthering the project.

Within perhaps a year, students will be provided with a sheet known as a guidance card, which will enable them to check up their ratings on the tests with the requirements for a great variety of positions. The Civil Service Commission is especially interested in this phase of the project, which will bring to the government service a more select roster of candidates, eliminating many who can foresee for themselves that they would not be successful in meeting government requirements. The guidance card will also work to prevent promising young people from entering fields where there is too little opportunity.

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Tantalum Combines Strange Properties

Metallurgy

Engineers Hear of the Wonders of Rare Metal

STRANGE tantalum, the metal rarer than gold, which absorbs 740 times its volume of hydrogen gas, successfully resists attack by the strongest mineral acids, and changes alternating into direct current, is finding greater use for dental instruments, surgical tools, pen points, hypodermic needles and acid proof pumps, Prof. George W. Sears, of the University of Nevada, reported recently to the American Institute of Mining and Metallurgical Engineers.

Even though tantalum was used for electric light filaments in 1906, until the past few years it has been only a rarity. It forms a much smaller portion of the earth's crust than gold, it is estimated. The production in 1928 was 35,000 pounds.

Because it absorbs gas so well, it is used for the metal parts of vacuum tubes.

Although there are other substances, which when used as an electrode of an electrolytic cell permit the passage of electricity in only one direction, tantalum is the best, said Prof. Sears. Electrolytic rectifiers for charging storage batteries contain it.

"Aqua regia, which readily dissolves both platinum and gold, has no action on this metal," continued Prof. Sears.

Hydrofluoric is the only acid successful in attacking it. Strong alkalis have no effect on it.

Tantalum can be cold rolled to a sheet one thousandth of an inch thick. It is found in the Black Hills of South Dakota and in Australia.

Colored Gold

FOUR comparatively common metals—silver, copper, nickel and zinc—fulfill milady's desire for precious gold in varying blends and shades of yellow, green and white.

Alloying gold not only makes for hardness and produces different karat values but, artistically done, it reveals the precious metal in color schemes. Edward A. Capillon, a metallurgist of Attleboro, Mass., told the same meeting.

"The gold-silver-copper alloys vary in color from light greenish-white through green, yellow and red, depending on the relative amounts of the three metals," Mr. Capillon explained. "Green or yellowish-green golds are also obtained by combining

relatively large amounts of zinc with gold, copper and small amounts of silver."

The bluish-white color of "white golds" depends on the presence in the alloy of both nickel and zinc, the metallurgist said.

Slicing a Hill

A QUARTER-INCH, three-strand-
ed steel wire, 1400 feet long, driven by an old four-cylinder automobile engine, is sawing huge slabs of marble from a hillside in the Ozark region of Arkansas.

Wire sawing has already proved its value in slate quarrying in Pennsylvania, and this is one of the first applications of the method to other fields. W. M. Weigel, mineral technologist of the Missouri Pacific Railroad, told the meeting.

Sand, hand-fed into the artificial crevice the wire makes, does the actual cutting. The wire travels 20 feet per second and cuts a complete section from the hill without wearing out and breaking. The entire operation is carried on by one man.

Vertical Copper

FOR years metallurgists have been content to roll and draw copper wire from wire bars cast horizontally—until J. Walter Scott and L. H. DeWald, of the Western Electric Company, found a better way.

These two began to cast their bars vertically, and by so doing literally got their metal in a "much better shape" for wire manufacture. The new method does away with the heavy wrinkles and skin oxide which form on top of the horizontally cast bar and cause defects in the final product, they say.

And strangely the electrical conductivity of vertically cast copper is about two-tenths of one per cent. higher than that of corresponding horizontally cast copper, tests show.

Smoke Damage

SIMPLE, apparently inevitable chemical reaction makes common locomotive smoke the dread enemy of the catenary trolley systems on electrified railways of today.

The smoke mixes with exhaust water vapor and forms sulfurous and then sulfuric acid from the hydrogen

sulphide it contains. This acid is absorbed by soot and tarry matter on overhead metal and immediately begins to eat the metal away.

Alloys of catenary wire and fixtures which stand up well under other forms of corrosion fail when subjected to the corrosive action of smoke. This is the conclusion reached by F. L. Wolf, chief engineer of the Ohio Brass Company.

Mr. Wolf speeded up his tests by putting the specimens in the smoke jack of a roundhouse. He found that one month of exposure there corresponds to about two years of moderately severe service.

The only apparent way of overcoming this corrosive menace is by running only electric trains on electrified roads. This practice is economically unjustifiable in most cases.

Explosive Dust

NATURE'S disastrous dust explosions in coal and metal mines are retaliation against man's feeble blasting. Such is the inference of Oscar A. Glaeser's explanation of the cause of dust explosions in a copper mine at Jerome, Arizona.

"The first few shots to go off charge the atmosphere with their own dust and stir up the dust that has accumulated during the shift," Mr. Glaeser said. "Finally some shot with considerable flame ignites this suspended dust and an explosion occurs."

Classes of Coal

FOURTEEN scientists and engineers presented as many technical papers, totaling 140 printed pages, before a section of the American Institute of Mining and Metallurgical Engineers as a step in the classification of the various grades of coal, ranging from lowly peat to the most highly metamorphosed forms of anthracite.

They are carrying on a work begun in November, 1926. Their papers described the product of practically all the coal fields of the United States. They are attempting to bring together the diverging classifications of science and commerce.

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Only three feet under the surface of the ground the temperature is as cool at midday as at midnight.

Welded Tanker

A new type of ocean-going craft has been launched.

The first rivetless cargo vessel is now riding the waves in Charleston harbor awaiting her service tests, after which she will begin a life of usefulness as a 2,500-barrel oil tanker.

Rivetless scows and rivetless yachts have been made, as well as several vessels combining both riveting and welding, but never before a completely welded, ocean-going carrier. The ship is 120 feet in length, 23 feet in width and has a ten-foot draft.

The arc welding was done under a new system of dove-tailed, lock-notched plates, developed by Richard F. Smith, a young ship designer and inventor. It effects a saving of 20 per cent. in weight and 25 per cent. in cost compared with riveted vessels.

Only 8,000 pounds of welding wire were used instead of 85,000 pounds of rivets. The cargo capacity is also greater because of the absence of rivets, bolts and angles. Nine workmen were employed to operate the acetylene cutting torch and electric arc welding machine used.

The vessel was built by the Charleston Dry Dock and Machine Company for the Texas Oil Company.

Engineering

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Passenger Pigeon

The passenger pigeon, long believed to be totally extinct, has been reported alive in the wilds of northern Michigan.

Prof. Philip Hadley, bacteriologist at the University of Michigan, has notified the journal, *Science*, that while hunting in an uninhabited wilderness in the northern peninsula of Michigan, his companion, familiar with the country, pointed out a bird which he declared to be a passenger pigeon, such as he had seen in vast numbers in his younger days. As Prof. Hadley looked, the bird took flight, and all he could see was its pigeon-like form and its pointed tail.

If the Michigan birds actually turn out to be passenger pigeons, it will be like a return of the dead. Passenger pigeons were once probably the most numerous birds in America, darkening the sky with their migrating clouds as the bison herds darkened the plains. But butcher-like hunting and the destruction of the Eastern forests brought them to extinction during the last third of the nineteenth century. The last specimen known to be alive died in a zoological park in 1914.

Dr. Theodore Palmer of the U. S.

Biological Survey here is somewhat skeptical of all reports of the survival of passenger pigeons.

"We get such reports frequently," he said, "but we have never been able to authenticate any of them. Some people who used to know the passenger pigeon now sometimes mistake the plover for it when they see one in flight. The plover is about the same size as a pigeon, has a pointed tail and flies in much the same manner."

"People also sometimes report the common mourning dove of the East, and the band-tailed pigeon of the Pacific Coast, as the passenger pigeon, for they do belong to the same family. But a sure distinguishing mark in both cases is the square tail, as contrasted with the pointed tail of the passenger pigeon."

Ornithology

Science News-Letter, March 1, 1930

Safety Film

In spite of the example in the Cleveland Clinic disaster of the danger of fire and explosion from stored X-ray nitrate base films, many communities are still as liable to such a calamity as they were before. Dr. P. F. Butler, radiologist at the Boston City Hospital, warned the Congress on Medical Education of the American Medical Association.

The safe acetate base film is no more dangerous than so much office stationery, Dr. Butler said. It costs about 20 per cent. more than the nitrate film, but the added expense is good insurance, he observed.

Photography—Medicine

Science News-Letter, March 1, 1930

Another Record

Official recognition by the National Aeronautic Association and the Federation Aeronautique Internationale, of Paris, of the feat of Test Pilot D. S. Zimmerley in reaching an altitude of 26,900 feet or greater at St. Louis, Mo., Sunday, Feb. 16, which is expected within a short time, will bring to America her second world record in the light airplane class.

The latest official list of world and American air records published Jan. 1, 1930, by the Contest Committee of the National Association gives America only three places in the light airplane class, and two of these will soon be world records, both held by Pilot Zimmerley. Apparently sufficient interest has not been aroused in this country in these events even to prompt qualifications for the American records.

Pilot Zimmerley's recent achievement will doubtless bring him the

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world altitude record in the third category of the light airplane class, which means that his plane was a single seater weighing between 440 and 771 pounds empty. He also holds the world distance record in this class, which he made on July 17, 1929, by flying from Brownsville, Texas, to Winnipeg, Canada, a distance of 1650 miles.

The only other U. S. record listed is in the first category, for two seaters weighing less than 881 pounds empty. This American record of 18,543 feet is held by Willfred G. Moore. The second category in the light plane class is for single seaters weighing less than 440 pounds. No American records are listed.

Aviation

Science News-Letter, March 1, 1930

Eagle Protected

The American eagle will hereafter be entitled to life, liberty and the pursuit of happiness, under the protectorate of the United States of America, if a bill reported to the Senate by the Agricultural Committee and now on the calendar is passed by Congress.

Killing, capturing, possessing, offering for sale or selling, purchasing, or shipping this eagle, "the emblem of the United States", will be forbidden "except for scientific, propagating, or exhibition purposes, or in defense of wild life or agriculture."

Any interference with the eagle's nests or eggs is also forbidden.

The maximum penalty carried in the bill for crimes against the bald eagle is one hundred dollars fine or sixty days imprisonment or both.

Ornithology

Science News-Letter, March 1, 1930

Rubber Experiments

The U. S. Department of Agriculture is watching the Edison-Ford goldenrod rubber experiments with interest, but is not carrying on any similar work of its own, officials stated. The work is still in the non-commercial stage, and farmers are not being encouraged to figure on putting in a crop of goldenrod instead of corn or cotton next spring.

That Mr. Edison is really in earnest about finding some native plant that may serve as a source of home-grown rubber, at least in emergencies, is evidenced by the fact that he had a well-known New York botanist look over a vast number of plants. Over

SCIENCE FIELDS

1,200 potential rubber-bearers were examined and identified by this worker before Mr. Edison settled on the one species of goldenrod that is now engaging his attention.

Of the eighty or so distinct species in the goldenrod genus, only one has been selected as being the most promising of results in rubber. It is known to botanists as *Solidago leavenworthii*, and its range is restricted to a comparatively limited area in the Southeast. It would probably grow well over a much larger territory, however, if it should prove profitable as a crop plant.

Mr. Edison has informed the Department of Agriculture that even within the limits of this one species there is a wide fluctuation in rubber content. One lot of plants may yield as little as one-half of one per cent. on a dry weight basis, another as much as six per cent. The problem then becomes one of selecting the best strain and endeavoring to improve it by breeding.

If goldenrod cultivation becomes commercially profitable, its propagation will not offer any serious difficulties. Almost all the species are perennials, sprouting freely from slender underground runners,* and these rootstocks can be cut up in pieces to plant, like potatoes. Seed need not be used at all. In case a specially desirable strain of goldenrod should be developed, this vegetative propagation would be an advantage, for propagation by seed would permit such a hybrid to revert to its lower-grade ancestral condition, whereas planting by cuttings would keep it up to grade.

Chemistry

Science News-Letter, March 1, 1930

Standard Drugs

If physicians would prescribe standard drugs instead of proprietary drugs for their patients in hospitals, they would help to cut the cost of hospital care for the patients, Dr. Ernest E. Irons, dean of Rush Medical College of the University of Chicago, advised the Congress on Medical Education and Hospitals.

Proprietary drugs are nearly always more expensive and yet no more effective. If a better product is sold under a trade name, the specifications of that brand may be justified, but most of the trade-marked brands comply only with the fixed minimum standards of the U. S. Pharmacopoeia,

William Gray, pharmacist of the Presbyterian Hospital in Chicago, explained to the same gathering. The prescribing of many brands of the same drugs causes duplication of stock and ties up money that might be used to better advantage. He named a number of drugs which under copyrighted names sell for from two to nine times as much as under their official titles.

"The shelves in some hospital pharmacies remind one of the exhibits of proprietary medicines in a chain-drug-soda-fountain-lunchroom," Dr. Irons declared.

A serious result of using drugs with widely advertised names is that patients tend to continue to use them without medical advice. Many drugs that are safe to use for short periods are dangerous if used in large doses over long periods, Dr. Irons pointed out. He told of one drug which in a number of cases had caused fatal damage to the liver when patients had taken it on their own responsibility after leaving the hospital.

Medicine—Pharmacy

Science News-Letter, March 1, 1930

Fruit Trees Attacked

California fruit trees have escaped attacks of the Mediterranean fruit fly, but they are now menaced with danger of root rot, Dr. Karl F. Kellerman of the U. S. Department of Agriculture explained to the House Committee on Appropriations.

This disease, which has hitherto been most damaging to cotton in Texas, has recently been discovered in the Department's experimental date garden at Indio, California.

It apparently does not affect citrus fruit trees, but rots the roots of such trees as peach, almond and pistachio, and any of the deciduous fruit trees.

California, which is on the verge of becoming an extensive cotton growing state, is alarmed both on account of her fruit trees and her cotton.

It is believed that nursery stock from Texas may have brought the root rot to the California experimental station, and government workers believe they can prevent its spread in California if they soak five acres of the experimental farm with disinfectant. The five acre tract affected is now isolated from the rest of the farm with an earth and oil barrier.

In Texas, where the fungus is widespread, no satisfactory method of treatment has yet been found which cotton growers can apply, though governmental and state agencies are constantly working on the problem.

Mycology

Science News-Letter, March 1, 1930

"Talkie" Laboratory

Completely equipped for the taking and finishing of "talkie" films, a new sound picture laboratory of the Bell Telephone Laboratories is now in use. By duplicating the conditions met with in actual practice, it is expected that further improvements in sound motion picture technique will be made.

The sound stage provides a floor space of 70 by 49 feet, and is fully connected for lights, microphones, camera motors and all the other necessary accessories. At one end is a monitoring booth, where the operator can regulate the sound from each of the microphones. This is on a balcony, and opens into a large monitoring room, where full sized loud speakers reproduce the sounds as they are recorded, and also provide for the "play-back" from one of the records immediately after it is recorded, for the benefit of the director and actors. A projection booth at one end of the sound stage, just below the monitoring booth, provides for recording a musical or sound accompaniment to silent pictures.

Full equipment is provided for recording on either wax records or film, and for developing and printing the film after exposure. A projection room with standard projection and reproducing equipment permits viewing of the films. Air conditioning equipment makes the best atmospheric conditions in all rooms.

Photography

Science News-Letter, March 1, 1930

Thumb Sucking

If all the little girls and all the little boys who suck their thumbs or bite their finger nails could be lined up in the favorite manner of statisticians, the little girls would make a much longer line than the little boys.

This greater frequency of finger-in-the-mouth habits among girls was reported by Dr. Willard C. Olson, speaking before the American Orthopsychiatric Association. Dr. Olson studied children in nursery schools and primary grades in order to measure the occurrence of oral habits among normal boys and girls.

Finger-nail-biting and thumb-sucking have a tendency to run in families. Dr. Olson found that "members of a family resemble each other more closely with respect to oral habits than persons selected at random."

In general, the underweight child will have more oral habits than the normal child at all ages, he stated.

Mental Hygiene

Science News-Letter, March 1, 1930

Cataracts of the Orinoco

—A Science Classic

Geography

VIEWS OF NATURE: or Contemplations on the Sublime Phenomena of Creation. With scientific illustrations. By Alexander von Humboldt. Translated from the German by E. C. Otté and H. G. Bohn. London, 1850.

THE name Orinoco, which the first discoverers gave to this river, and which probably owes its origin to some confusion of language, is unknown in the interior of the country. For in their condition of animal rudeness, savage tribes only designate by peculiar geographical names, those objects which might be confounded with others. Thus the Orinoco, the Amazon, and the Magdalena, are each simply termed *The River*, the *Great River* and *The Great Water*; whilst, those who dwell on the banks of even the smallest streams distinguish them by special names.

The Orinoco is one of those remarkable rivers which, after numerous windings, first towards the west and then to the north, finally returns towards the east in such a manner as to bring both its estuary and its source into nearly the same meridian. From the Chiguire and the Gehette as far as the Guaviare, the course of the Orinoco inclines westward, as if it would pour its waters into the Pacific. Here branches off to the south, the Cassiquiare, a remarkable river, but little known to Europeans, which unites with the Rio Negro, or as the natives call it, the Guainia: furnishing the only example of a bifurcation which forms in the very interior of a continent a natural connection between two great river valleys.

The nature of the soil, and the junction of the Guaviare and Atabapo with the Orinoco, cause the latter to deflect suddenly northwards. From a want of correct geographical data, the Guaviare, flowing in from the west, was long regarded as the true source of the Orinoco. The doubts advanced since 1797 by an eminent geographer, M. Buache, regarding the possibility of a connection with the Amazon, have, I trust, been completely set at rest by my expedition. In an uninterrupted voyage of 920 miles, I penetrated through a remarkable network of rivers, from the Rio Negro, along the Cassiquiare, into the Orinoco;

"The twofold object of this work," states the author, "—an anxious endeavour to heighten the enjoyment of nature by vivid representations, and at the same time to increase, according to the present state of science, the reader's insight into the harmonious co-operation of forces,—was pointed out by me in the preface to the first edition, nearly half a century ago. . . . In my eightieth year I have still the gratification of completing a third edition of my work." The first edition appeared in 1807, the second in 1826, and the third, from which the translation here quoted was made, in 1849.

across the interior of the continent, from the Brazilian boundary to the coast of Caracas. . . .

To this point, that is, as far as the mouth of the Guaviare, the Orinoco flows along the southern declivity of the chain of the Parime. From its left bank, across the equator, and as far as the parallel of 15° south lat., extends the boundless wooded plain of the river Amazon. At San Fernando de Atabapo the Orinoco, turning off abruptly in a northerly direction, intersects a portion of the mountain chain itself. Here are the great waterfalls of Atures and Maypures, and here the bed of the river is everywhere contracted by colossal masses of rocks, which give it the appearance of being divided by natural dams into separate reservoirs.

At the entrance of the Meta stands, in the midst of an enormous whirlpool, an isolated rock, which the natives very aptly term the "Rock of Patience," because when the waters are low, it sometimes retards for two whole days the ascent of the navigator. Here the Orinoco, biting deep into its shores, forms picturesque rocky bays. Opposite the Indian mission of Carichana, the traveler is surprised by a most remarkable prospect. Involuntarily his eye is arrested by a steep granite rock, "El Mogote de Cocuyza," a cubiform mass, which rises precipitously to a height of more than 200 feet; and whose summit is crowned with a luxuriant forest. Like a Cyclopic monument of simple grandeur, this bold promontory towers high above the tops of the surrounding palms, cutting the deep azure of the sky with its strongly marked out-

lines, and lifting, as it were, forest upon forest.

On descending beyond Carichana, the traveler arrives at a point where the river has opened itself a passage through the narrow pass of Baraguan. Here we everywhere recognize traces of chaotic devastation. To the north, towards Uruana and Encaramada, rise granite rocks of grotesque appearance, which, in singularly formed crags of dazzling whiteness, gleam brightly from amidst the surrounding groves.

At this point, near the mouth of the Apure, the stream leaves the granitic chain, and flowing eastward, separates as far as the Atlantic, the impenetrable forests of Guiana from the Savannahs, on whose far distant horizon the vault of heaven seems to rest. Thus the Orinoco surrounds on the south, west, and north, the high mountain chain of the Parime, which occupies the vast space between the sources of the Jao and of the Caura. No cliffs or rapids obstruct the course of the river from Carichana to its mouth, excepting, indeed, the "Hell's Mouth" (Boca del Infierno) near Maitaco, a whirlpool occasioned by rocks, as at Atures and Maypures, which does not, however, block up the whole breadth of the stream. In this district, which is contiguous to the sea, the only dangers encountered by the boatmen arise from the natural timber-floats, against which canoes are often wrecked at night. These floats consist of forest trees which have been uprooted and torn away from the banks by the rising of the waters. They are covered, like meadows, with blooming water-plants, and remind us of the floating gardens of the Mexican lakes.

After this brief glance at the course of the Orinoco and its general features, I pass to the waterfalls of Maypures and Atures. . . .

The geognostical aspect of this region, the insular form of the rocks of Keri and Oco, the cavities worn in the former by the current, and which are situated at exactly the same level as those in the opposite island of Uivitari; all these indications tend to prove that the Orinoco once filled the whole of this now dried-up bay. It is probable that the waters formed a wide lake, as long as the northern dam withstood their passage. When this

barrier gave way, the Savannah now inhabited by the Guareke Indians emerged as an island. The river may perhaps long after this have continued to surround the rocks of Keri and Oco, which now picturesquely project, like castellated fortresses, from its ancient bed. After the gradual diminution of the waters, the river withdrew wholly to the eastern side of the mountain chain.

This conjecture is confirmed by various circumstances. Thus, for instance, the Orinoco, like the Nile at Philæ and Syene, has the singular property of colouring black the reddish-white masses of granite, over which it has flowed for thousands of years. As far as the waters reach one observes on the rocky shore a leaden-coloured manganeseous and perhaps carbonaceous coating which has penetrated scarcely one-tenth of a line into the stone. This black coloration, and the cavities already alluded to, show the former water level of the Orinoco.

These black cavities may be traced at elevations of from 160 to 192 feet above the present level of the river on the rocks of Keri, in the islands of the cataracts; in the gneiss-like hills of Cumadanimari, which extend above the island of Tomo; and lastly at the mouth of the Pao. Their existence proves, what indeed we learn from all the river-beds of Europe, that those streams which still excite our admiration by their magnitude, are but inconsiderable remains of the immense masses of water belonging to a former age.

These simple facts have not escaped even the rude natives of Guiana. Everywhere the Indians drew our attention to these traces of the ancient water-level. Nay, in a Savannah near Uruana there rises an isolated rock of granite, which, according to the testimony of persons worthy of credit, exhibits at an elevation of between 80 and 90 feet, a series of figures of the sun and moon, and of various animals, especially crocodiles and boa-constrictors, graven, almost in rows. At the present day this perpendicular rock, which well deserves the careful examination of future travelers, cannot be ascended without the aid of scaffolding. In a similarly remarkable elevated position, the traveler can trace hieroglyphic characters carved on the mountains of Uruana and Encaramada.

If the natives are asked how these characters could have been graven there, they answer that it was done in former times, when the waters were so high that their fathers' canoes

floated at that elevation. Such lofty condition of the water level must therefore have been coeval with these rude memorials of human skill. It indicates an ancient distribution of land and water over the surface of the globe widely different from that which now exists; but which must not be confounded with that condition when the primeval vegetation of our planet, the colossal remains of extinct terrestrial animals, and the oceanic creatures of a chaotic world, found one common grave in the indurating crust of our earth.

The lofty falls of Niagara, which are 150 feet in height, derive their origin, as is well known, from the combined precipitation of one enormous mass of water. Such, however, is not the case with respect to the cataracts of Maypures, nor are they narrow straits or passes through which the stream rushes with increasing velocity, like the Pongo of Manseriche on the Amazon, but rather to be regarded as a countless number of small cascades succeeding each other like steps. The *Raudal*, (as the Spaniards term this kind of cataract,) is formed by an archipelago of islands and rocks, which so contract the bed of the river that its natural width of more than 8500 feet is often reduced to a channel scarcely navigable to the extent of 20 feet. At the present day the eastern side is far less accessible and far more dangerous than the western.

At the mouth of the Cameji the boatmen unload their cargo that they may leave the empty canoe, or, as it is here called, the *Piragua*, to be piloted by Indians well acquainted with the *Raudal*, as far as the mouth of the Toparo, where all danger is supposed to be past. Where the rocks or shelvy ledges, (each of which has its particular name,) are not above two or three feet in height, the natives venture to shoot the rapid with their canoes. When, however, they have to ascend the stream, they swim in advance of the *piragua*, and after much labour, and, perhaps, many unsuccessful efforts, succeed in throwing a rope round a point of rock projecting above the breakers, and by this means draw the canoe against the stream, which, in this arduous operation, is often water-logged, or upset.

Sometimes the canoe is dashed to pieces on the rock, and this is the only danger the natives fear. With bleeding bodies they then strain every nerve to escape the fury of the whirlpool and swim to land. Where the rocky ledges are very high and form a barrier by extending across the en-

tire bed of the river, the light canoe is hauled to land and dragged for some distance along the shore on branches of trees which serve the purpose of rollers.

The most celebrated and most perilous ledges are those of Purimarimi and Manimi, which are between nine and ten feet in height. It was with surprise I found, by barometrical measurements, that the entire fall of the *Raudal*, from the mouth of the Cameji to that of the Toparo, scarcely amounted to more than 30 or 32 feet. (A geodesic levelling is not practicable, owing to the inaccessibility of the locality and the pestiferous atmosphere, which swarms with mosquitoes.) I say with surprise, for I hence discovered that the tremendous roar and wild dashing of the stream arose from the contraction of its bed by numerous rocks and islands, and the counter-currents produced by the form and position of the masses of rock. The truth of my assertion regarding the inconsiderable height of the whole fall will be best verified by observing the cataracts, in descending to the bed of the river, from the village of Maypures, across the rocks of Manimi.

At this point the beholder enjoys a most striking and wonderful prospect. A foaming surface, several miles in length, intersected with iron-black masses of rock projecting like battle-mented ruins from the waters, is seen at one view. Every inlet and every rock is adorned with luxuriant forest trees. A perpetual mist hovers over the watery mirror, and the summits of the lofty palms pierce through the clouds of vapoury spray. When the rays of the glowing evening sun are refracted in the humid atmosphere, an exquisite optical illusion is produced. Coloured bows appear, vanish, and reappear, while the ethereal picture dances, like an *ignis fatuus*, with every motion of the sportive breeze.

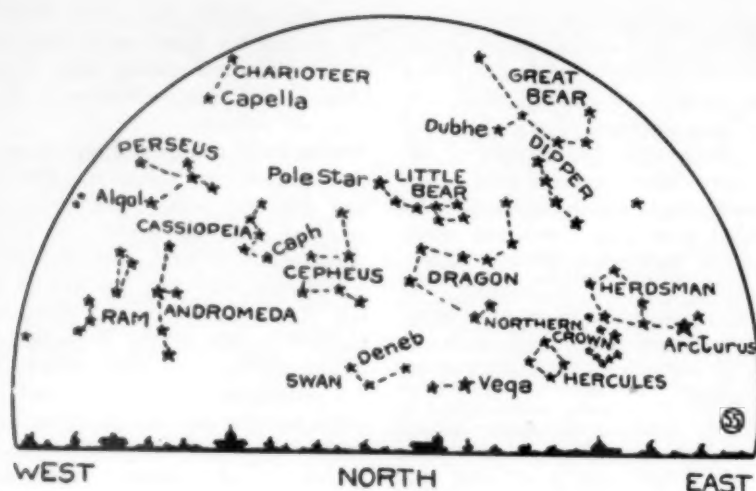
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Furniture shipments from the United States to Canada increased 41 per cent. last year.

Evergreen trees lose a crop of leaves each year, but not all at once, like the deciduous trees.

The gecko, one of the rarest of lizards, lives in the African desert and yet has webbed feet.

Compulsory medical supervision of women working in candy industries has been recommended by the Consumers' League of Massachusetts.



These maps show you the sky as it appears these March evenings. Hold them in front of you, and face north or south, and you can identify the stars in the heavens.

March Brings Us the Springtime

Astronomy

By James Stokley

TEN first magnitude stars, the largest of the planets, and, in the early evening at the end of the month, one of the earth's next door neighbors; these make up the most important features of the March evening sky. Another important astronomical event of the month takes place on the twenty-first at 3:30 a. m. Eastern Standard Time, when the sun enters the sign of Aries. This is the vernal equinox, and, by convention, represents the beginning of spring. At that moment the sun will be directly overhead at noon to a person on the Equator and in both northern and southern latitudes the days and nights will be of equal length. Though storms may occur around this time, as they may at any time, the equinox will not be the cause. The idea of "equinoctial" storms is a myth that has no scientific foundation.

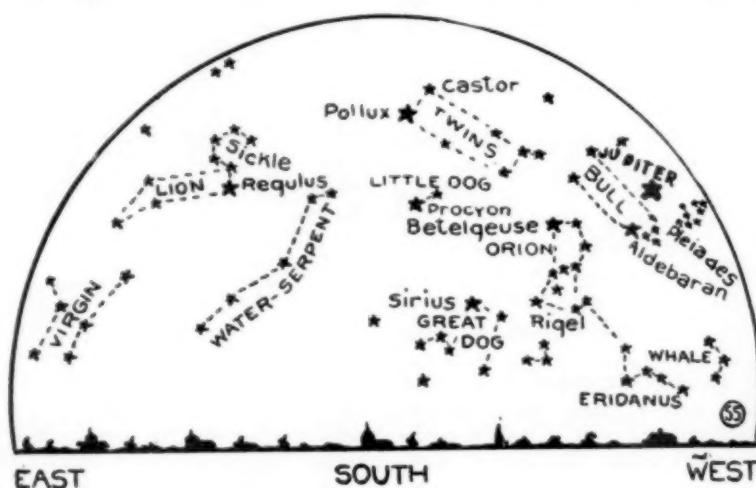
The bright stars this month are the same as those described for February, with the addition of two others that have now risen high into the evening sky. Six of them are arranged in a circle around Betelgeuse. These are in the western sky. To the southwest are the familiar three stars that make up the belt of Orion. Above the belt is Betelgeuse and below it is Rigel. Both of these are also in the constellation of Orion. About the same height above the horizon as Rigel, but farther to the south, is the very brilliant star, Sirius, the dog star, in the constellation of Canis Major, the Great Dog. This is the brightest of all the stars in the sky. Above Sirius is a star of only slightly less brilliancy, Procyon, the most brilliant

star in the constellation of the Little Dog, Canis Minor. Still higher is Pollux, the brighter of the two twins, Gemini. To the northwest is Capella, in Auriga, the charioteer. Lower yet, and almost directly west, is Aldebaran, representing the eye of the bull, Taurus. Near it is a still brighter object, the planet Jupiter. You will have no trouble in distinguishing between Aldebaran and Jupiter, however, because the planet is distinctly brighter and shines with a steadier light than the reddish star.

To the southeast, high above the horizon, is a familiar group of stars in the shape of a reversed question mark, or sickle, with the handle downward. The bottom star is the brightest. This is Regulus, in the constellation of Leo, the lion, the blade of the sickle forming the lion's head. Below Leo is Virgo, the virgin, containing the bright star Spica, now near

the horizon. North of Virgo, and a little farther above the horizon, is Bootes, the brightest star of which is Arcturus. These make up the ten first magnitude stars of the March sky.

Of all the thousand or so known members of the solar system, including the earth, Jupiter is the largest. Next to occasional times when Venus is at its brightest, and the rather rare occasions when Mars is close, Jupiter is the brightest of the planets. Unlike Venus, which can only be seen in the west shortly after sunset or the east before sunrise, Jupiter may be seen in any part of the night sky and is frequently a conspicuous object. This month Jupiter is about 490,000,000 miles away from the earth. This means that its light takes nearly three quarters of an hour, speeding along at 186,000 miles every second, to reach the earth. The speed of light



The Stars in March—Continued

is of particular interest in connection with Jupiter because this planet, with its moons, presented the first proof that light takes time to travel.

It used to be thought, centuries ago, that the transmission of light was instantaneous. Galileo, the famous Italian astronomer, is said to have made one of the first experiments to test its speed. He used two distant towers, sending a friend to one and ascending the other himself. Both had lanterns and Galileo uncovered his. As soon as the friend saw the flash of light he was to uncover his and Galileo thought he might be able to measure the difference in time. However, light travels so rapidly that this method is far too crude to give any results of value.

Galileo was also the first to use the telescope to observe an astronomical object, and with it, in January, 1610, he discovered the four satellites, or moons, of Jupiter. By the year 1675 they had been well enough observed that movements could be predicted with some accuracy. Frequently the satellites pass into the shadow of Jupiter, when they are eclipsed and become invisible to earthly observers. Predictions were made of the times that these eclipses should occur. A Danish astronomer by the name of Olaus Römer found that the eclipses did not always occur at the time they were supposed to. Sometimes they were a few minutes too early, and at other times a few minutes too late.

Römer was a very ingenious man and is famed as the inventor of the transit circle, an instrument that is still used to determine time from the stars. He noticed that the eclipses came too early when Jupiter and the earth were both on the same side of

the sun, and too late when the planets were on opposite sides of the sun, and farthest apart.

Light takes time to travel, he said to himself. Therefore, we see an object in the sky not as it is, but as it was when the light started on its way. The more distant the object is from the earth, the longer the light takes to reach us and the later we see it. The greatest difference in time between the predicted and observed eclipses is about eight minutes, too early or too late. This suggested to Römer that the light took about 16 minutes to cross the orbit of the earth, 186,000,000 miles. It was in 1675 that Römer made this suggestion, but not for years later was it generally accepted, and now we know it to be the true explanation.

By very delicate modern methods, chiefly due to Prof. A. A. Michelson, of the University of Chicago, a very precise determination can be made of the time that light takes to travel between two earthly points. So accurately has the speed been obtained in this manner that from the differences in times of the eclipses of the satellites, we can determine the distance of the sun. This is reversing Römer's method, for he knew roughly the distance of the sun and from it determined the speed of light.

Another planet, visible in the March evening skies just after sunset at the end of the month, is Venus, which during the fall and early winter was a morning star, but is now getting over to the eastern side of the sun. Early in March it cannot be seen, but on the 16th it sets about 15 minutes after the sun. On the 31st it sets at 7:26 p. m. Then, if you look carefully at the western sky shortly after sunset, you may be able to see its brilliant point of light in the gathering dusk. Next month it will be still higher in the sky and will become more and more conspicuous until September when it will be highest in the evening sky. Even after that it will continue to brighten for a little longer reaching its greatest brilliance on October 18. On March 31 the young crescent moon passes close by Venus and then the planet may be more easily located. But even the moon, a little over a day old, will be rather hard to locate and you must look for it right after sunset. On March 7 the moon, then in first quarter, passes close to Jupiter, thus adding to the splendors of this part of the sky.

NATURE RAMBLINGS

By Frank Thone



Dead Leaves

There is a sentimental German novel of the last century, in which the jilted hero wanders mournfully through the wet woods during a late-winter thaw. He looks at the dead leaves, likening them to himself, and the quickening thought catches him, "All things move to an end, and in the end a new beginning is eternally seeded."

Therein he showed himself a shrewd naturalist, no matter how dismally he felt. It is hard to say which is the more valuable thing about a forest: the standing and marketable timber, or the generations of accumulated dead leaves under foot. The trees cannot grow except by the mulch about their roots which they themselves prepare and use as food-factories during the summer.

"Duff," the forester calls this organic complex of the forest floor; and if a fire is so bad that it has eaten the duff, he just moves on to another forest. Without duff, he knows that the stripped ground will not build another forest in time that he can reckon.

A sharp lesson in the value of dead leaves has been learned in certain Scandinavian forest regions. When the farmers took to raising sugar beets instead of general crops, they also took to hauling off the leaves from their woodlots to use as roughage and bedding for their cattle. They had to have something, and beet fields do not yield straw.

That was all very well for a time. But after a few years the puzzled farmers noticed that their trees had stopped growing. Their precious timber, which is measured almost by the cubic inch, was not doing its bit for national prosperity. Only when the crown foresters came and told them how they were robbing their forests to enrich their fields did they understand. Now they give the trees a chance to feed, and the woodlots have resumed their normal rate of growth.

Beauty in a Ditch

Photography

Among the photographs that attracted much attention at an exhibition of the London Salon of Photography not long ago was one that stood out as a gleaming example of the beauty to be found in common things—even in ugly things—by a sufficiently discerning eye. S. Uyeda saw a lot of big round oil spots floating on the top of a wayside ditch, the interspaces pebbled with smaller spots. He set his camera down close to the ground, to flatten the circles into ellipses, and to increase the illusion of an arrangement of the big spots into rows. Result: a prize photograph.

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How Your Adrenals Determine Your Character—*Continued*

normal amount of its hormone epinephrin. Lack of stimulus of the adrenal gland by warm tropical climates is one reason why the European is unable to adapt himself readily to life in the tropics. Another reason for this is given by the British scientist, W. Cramer, in a recently published book.

"There is a close chemical relationship between adrenalin and pigment. It has been shown that pigment can be formed from adrenalin and substances allied to adrenalin by a special ferment. . . . When owing to disease of the adrenal medulla or Addison's disease the formation of adrenalin is impaired, pigment is deposited in the skin. The pigmentation of the races living in tropical climates may perhaps be the method by which the organism disposes of the material which would otherwise have been used for the formation of adrenalin. In the white races this method of excretion of the excess of adrenalin of its precursor is not so well developed and this may be one of the reasons why white races

are less fitted for a tropical climate," said Dr. Cramer.

The powerful hormone of the adrenal glands has been extracted in pure form, in fact this was the first hormone to be obtained in pure state. The work was done at the close of the last century and the beginning of this one. Professor John J. Abel of the Johns Hopkins University and Jokichi Takamine, a Japanese investigator, are the scientists chiefly responsible for the extraction and crystallization of this hormone. It has also been prepared synthetically in the laboratory.

Adrenalin has a wide use in modern medicine, though a drug, ephedrin, has been found to have similar properties and has replaced adrenalin to some extent in the treatment of asthma. Adrenalin acts to contract the arteries and so checks the flow of blood. Other uses are for relief of shock, as an aid in heart failure and in conditions of circulatory weakness.

Adrenalin has long been used to raise the blood pressure, particularly

in cases of shock following severe injuries or operations, and because of its relaxing effect on the bronchial muscles it has been used effectively in treating bronchial asthma. However, to produce the desired effect, the adrenalin had to be injected directly into a vein, and for each fresh attack a fresh injection of adrenalin had to be made.

A new method of using adrenalin has been put forth quite recently by Dr. A. B. Luckhardt of the University of Chicago and Dr. Theodore Koppányi of Cornell Medical College. These men have shown in dogs that adrenalin is capable of elevating the blood pressure even if injected beneath the skin, but they have also discovered the conditions under which the blood pressure elevating effect of the adrenalin injected under the skin may be elicited. They found that about fifteen minutes after the injection of adrenalin under the skin, when the injected area was gently massaged, there was at once a very considerable and protracted rise in blood pressure. It was even possible to produce blood pressure rises from such areas that had been injected twenty-four hours before the massage.

Dr. Koppányi has lately shown that adrenalin injected underneath the skin with massage of the injected areas is just as effective in man as in dogs. In both cases the adrenalin forms a reservoir underneath the skin, the massage of which results in a blood pressure rise for over twenty-four hours. A New York surgeon, Dr. Howard Lilienthal, has shown that by using the method of Drs. Luckhardt and Koppányi he could restore a patient suffering from traumatic shock.

Besides bronchial asthma, hives and hay fever respond very readily to adrenalin. It has heretofore been necessary for each attack of these diseases to be checked by a new injection of adrenalin. The method of massaging the injected areas does away with that very often inconvenient procedure, and during the course of a day or two only one adrenalin injection is necessary. The patient himself may be instructed to massage the injected area with a piece of cotton. Thus he will get the benefit of the full therapeutic effect of adrenalin. Clinical reports have already substantiated the effect of the massage of the adrenalin-injected areas in these diseases.

Invisible Flying—*Continued*

for Promotion of Aeronautics in fog flying. Although they showed conclusively that it is possible to land by instruments alone the procedure is still in a highly experimental stage and needs to be brought to a point where it is commercially applicable, Lieutenant Doolittle explained.

"When this is brought about," he said, "the airplane will become the safest known means of transport as it will be the only one that can operate unhampered by fog."

In flying "blind" in the tests, the take-off was made in the path of a radio beam with all instruments correctly calibrated and set at zero, the aviator said. Piloting by means of gyroscopic instruments, he followed the beam about four miles while the plane climbed 1000 feet. Then the plane was turned around and headed back into the beam.

"As the beacon, the source of the beam, was approached, the beam became narrower," he said, "and, while it was more difficult to follow, the course became much more exact. At the exact moment of passing over the beacon house, the reeds affected by the beam stopped vibrating momentarily and then began to vibrate in the opposite direction."

The beam was followed about four miles again in the new direction, a turn made and the field approached

at an altitude of about 400 feet. As Lieutenant Doolittle was preparing to land, he took care to follow with the aid of the directional gyroscope, the exact center of the beam. An air speed of 60 miles an hour and a descent less than 600 feet per minute were assumed, both accurately indicated on the instrument board, because he had previously found that his plane would absorb the shock of hitting the ground at this speed and angle. The aviator read his altitude within 10 feet of the exact figure from an instrument for which varying air pressure was checked by radio from the ground. The actual landing was made at about 55 miles per hour and 400 feet glide per minute.

Lieutenant Doolittle's interest in flying began when he entered the air corps in the World War at the age of 21. He was the first to fly across the continent in a day, making the trip from Jacksonville, Fla., to San Diego, Calif., within 24 hours during 1922. In the fall of 1925, he won the Schneider trophy race in Baltimore. The difficult outside loop, performed by only a few daring pilots, has been flown by Lieutenant Doolittle, and he has been awarded the Distinguished Flying Cross.

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Latin America As Field for Engineers

Civil Engineering

Each Country Presents Its Own Problems says Mr. Hebard

OPPORTUNITIES similar to those in the United States before the Civil War, are open to engineers today in Latin America, R. W. Hebard, New York contractor, declares in a report just made to the American Road Builders Association. This is the reason, he says, that the Central and South American countries have fascinated and intrigued the engineer and contractor as perhaps no other in this generation.

"Here in Latin America were found rich productive countries with an interesting historical background, with an educated, cultured governing class, but without railways and highways or ports; important populated cities were lacking in or utterly without adequate water supply or modern sewerage and paving; important picturesque capital cities were found lying back in the mountains, two and three weeks distant from the coast, which could only be reached by mule and small river steamers; countries and cities, in one word, in more or less the same condition as that of the Spanish Colonial period. Such a field was bound to attract the American engineer as no other, not necessarily or primarily for reasons of possible financial gain, but because the pioneer spirit which is by no means extinct in the American race, asserted itself and drew these men to this part of the world. We have seen, in consequence, commencing one hundred years ago, the American engineer blazing the way well in advance of the banker, salesman and other business missionaries."

Mr. Hebard combats the idea popularly held in this country that all the twenty Latin American Republics are more or less the same. The contractor and his staff working in South America must adapt themselves to widely varying conditions not only of government and political situations but of topography and climate, of transportation facilities or lack of them, of labor conditions, and of characteristics of the people themselves.

"In this vast region of which little was known, where almost every facility was lacking, man could dream and see visions of prosperity replacing poverty, of comfort supplanting

hardship. A few of these men had vision coupled with common sense and ability. They succeeded. But the majority failed," explained Mr. Hebard, "and they will continue to fail through lack of understanding the economic obstacles which have to be overcome. Propaganda is not now required to convince Latin America that modern highways and railways should be built, that cities should be paved and water and sewage systems installed. All of these things are desired in those countries as much as here. The realization of these desires, however, is frequently balked by cold, unescapable, economic facts.

"In order to build railways, freight, either actual or potential, must exist. Unfortunately in all tropical countries, agricultural products which in the temperate zones are the source of the greatest single

Triplets are born once in every 10,000 births, according to a recent statistical study.

The great agricultural census to be taken in 1930 will represent about 98 per cent. of the agriculture of the world.

A thornless blackberry and a thornless dewberry are being raised successfully in some parts of the south.

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class of tonnage, are in general of high value and small bulk. This can best be illustrated by comparing wheat with coffee. One family by the use of machinery can readily grow 160 acres of wheat, producing on the average, say 100 tons of grain. One family can grow at the most, 6 acres of coffee, with a production of less than 2 tons. Measured in railway tonnage, a given number of people in the temperate zone will produce twenty-five times as much as the same number of people in the tropics. This comparison holds good with coffee, cacao, rubber, etc. While these products have such a high value per pound that they can stand a high freight rate, this rate is often controlled by the competition of primitive transportation methods. It is for these reasons that there are so few railways in the tropics, and the greater part of these have been built with the aid of heavy Government subvention."

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NATURE CAMPS

for

Teachers and Nature Lovers; in the mountains of central Pennsylvania midst many rare plants and animals.

Penn State Summer Session

First Camp—June 26 to July 17.

Second Camp—July 16 to August 6.

Intensive Field Work

Special Lectures by Elmer W. Ekblaw, Mrs. Anna Botsford Comstock, J. G. Needham and others.

Illustrated bulletin on request

Professor George R. Green

Director of Nature Camps

STATE COLLEGE, PA.

FIRST GLANCES AT NEW BOOKS

PALEOLITHIC MAN AND NILE-FAIYUM DIVIDE—K. S. Sandford and W. J. Arkell—*University of Chicago Press* (\$5). This is not a thick book, but its seventy-odd pages and dozen plates record one of the most important pieces of research that has ever been done in that much-worked-over land, Egypt. For in it the authors tell, in straightforward, orderly fashion, of the final complete bridging of the gap between the time when there were no men in Egypt and the beginning of the Neolithic, whence the record has already been carried forward by an army of other workers. Hitherto the story of the Old Stone Age on the Nile has been fragmentary and confused; now it is complete and well-arranged, and back of it stands equally complete and well-arranged the geological history of the cutting of the Nile valley itself, with its important adjunct the Faiyum basin.

Archaeology—Geology
Science News-Letter, March 1, 1930

HEALTH INVENTORY OF NEW YORK CITY—Michael M. Davis and Mary C. Jarrett—*Welfare Council of New York City* (\$2). The study was made with the aim of finding a way to increase the efficiency of the health service of New York City. This report should be extremely useful to health workers and directors of health services, both public and private, all over the country. While the study includes both public and private agencies, it is limited to preventive work and does not take up the curative branch of health service.

Public Health
Science News-Letter, March 1, 1930

FUNDAMENTALS OF EDUCATIONAL PSYCHOLOGY—Ida Morris Gast and Harley Clay Skinner—*Sanborn* (\$2). In these days when psychology is being applied to educational processes so rapidly and extensively, a text such as this is a practical little volume indeed. Here is a level-headed, up-to-date discussion of intelligence and intelligence tests. Here, too, are chapters on the gifted child, on the learning process, habit, attention and interest, memory, and other psychological matters which the teacher deals with every day, for better or worse. The plan of citing at the foot of the page the references from which incidents and figures are taken enables the reader to look up further information with a minimum of difficulty.

Education—Psychology
Science News-Letter, March 1, 1930

GEOPHYSICAL METHODS OF PROSPECTING—C. A. Heiland—*Colorado School of Mines* (\$1). A very informative review of the recently developed ways man has devised for detecting information about location and extent of the deposits of valuable substances beneath the earth's surface. Some theory is given in semi-technical fashion, and actual accomplishment is emphasized. Gravity, magnetic, radioactive, geothermal, seismic, and electrical methods are considered.

Geophysics
Science News-Letter, March 1, 1930

RATTLING THE CUP ON CHICAGO CRIME—Edward D. Sullivan—*Vanguard Press* (\$2). Those who have been wondering "what all the shooting's for" in Chicago will find out by reading this very interesting book. Mr. Sullivan has given an illuminating picture of Chicago's politics, rackets and gangs, including the philosophies of Scarface Al Capone and Big Bill Thompson, Chicago's mayor. The book is written in a delightful style which makes it easy reading even for those who are not directly interested in criminology and sociology. The book also furnishes a striking commentary on prohibition.

Criminology
Science News-Letter, March 1, 1930

THE PASSING OF NORMALCY—Charles W. Wood—*Forbes* (\$3). With Marion, Ohio, the home of President Harding, as the example, Mr. Wood made a sociological study of American life today. Unlike the now famous study of Middletown in the same state, the author relies less upon statistics and more upon his conversations and impressions. The publisher's blurb says that the author "points out that business has replaced the family as the dominant institution of society and that business, for its own good, must make a serious study of its new role."

Economics—Sociology
Science News-Letter, March 1, 1930

THE BIRD BOOK—Charles P. Shoffner—*Manson* (\$2). This is a rather unusual book on birds, combining features of the elementary textbook with features of the popular book of general information about birds. Its lists of review questions at the chapter ends, covering all features of avian natural history, will be found especially valuable for classroom and nature study club use.

Ornithology
Science News-Letter, March 1, 1930

FLORA OF THE HERMIT SHALE, GRAND CANYON, ARIZONA—David White—*Carnegie Institution* (\$2.50 paper; \$3.50 cloth). In this publication Dr. White sums up the results of several years of collection and research in an important Permian fossiliferous shale in the Grand Canyon. It was virgin territory he explored, for neither its true age nor its fossil-bearing character was known before 1915. The collections have therefore yielded many new species. Some of these are assignable to new genera. In his nomenclature, Dr. White has been very happy in his adapting local geographic names: *Supaia*, *Yakia*, *Eltozaria*, etc. The genus *Supaia* seems to be especially well developed, comprising eleven, or possibly twelve species. The author's brief discussion of the evidence of the fossil plants as to climate will be of interest to students of paleoecology.

Paleobotany
Science News-Letter, March 1, 1930

TOBACCO AND ITS USE IN AFRICA—B. Laufer, W. D. Hambly and R. Linton—*Field Museum* (25c). The natives of Africa may not have known of the "miraculous weed" until post-Columbian times, but since then they certainly have shown themselves expert and ingenious in devising methods for extracting enjoyment from it. One of the illustrations in this interesting booklet shows a Negro smoking his musket!

Ethnology
Science News-Letter, March 1, 1930

FLOW OF WATER IN DRAINAGE CHANNELS—C. E. Ramser—*U. S. Government Printing Office*—(40c). This technical bulletin 129 of the U. S. Department of Agriculture contains knowledge gained by hydraulic engineers through years of experience. Ramser has accurately determined the coefficient, *n*, of Kutter's formula for all kinds of open channels. The types of channels are so well illustrated and described that it is comparatively easy to find one similar to a given problem.

Hydraulic Engineering
Science News-Letter, March 1, 1930

HOW TO FLY—Barrett Studley—*Macmillan* (\$3). Not a history of the romance of aviation, but a book that aspiring pilots will wish to read. It is evolved from the manual of the Naval Air Station at Pensacola, Florida, written by Lieut. Studley.

Aviation
Science News-Letter, March 1, 1930